REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 21-30 are presently active in this case. Claims 11-20 were cancelled by a previous amendment. The present Amendment adds new Claims 21-30 without introducing any new matter, and cancels Claims 1-10 without prejudice or disclaimer.

The outstanding Office Action, Claim 3 was objected to for informalities. Claims 1-4 and 6-10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Katta et al. (U.S. Patent No. 6,115,421, hereinafter "Katta"). Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Katta in view of Kawashima et al. (Japanese Patent Application No. 2003-092759, hereinafter "Kawashima")

In response, Claims 1-10 are cancelled without prejudice or disclaimer, and new Claims 21-30 are added. New Claims 21-25 are directed to an apparatus for coding a moving image, and new Claims 26-30 are directed to a method for coding a moving image. The new claims find non-limiting support in the disclosure as originally filed. For example, the determination unit of independent Claim 21 finds non-limiting support in the specification from p. 19, l. 3, to p. 22, l. 8. No new matter has been added.

In response to the rejection of the claims under 35 U.S.C. § 103(a), in light of the newly presented claims, Applicants respectfully request reconsideration of this rejection and traverse the rejection, as discussed next.

A specific feature of Applicants' new independent Claim 21 is directed to the correcting of the upper limit and the lower limit of the quantization scale by comparing an evaluation value with each threshold. First, the evaluation value is calculated from the second occupancy and the change rate of the second occupancy of the second buffer. As shown in the equation at the bottom of page 19 in Applicants' specification, the evaluation

value represents a tendency of transition of the second occupancy in the second buffer, i.e., the evaluation value becomes larger if the second occupancy is larger or if an increase rate of the second occupancy is higher.

Next, the evaluation value is compared with the second and third thresholds, as recited in Applicants' new independent Claim 21. The second threshold is set for detecting the second occupancy under a status of underflow or a sudden decrease in the second buffer. The third threshold is set for detecting the second occupancy under a status of overflow or a sudden increase in the second buffer. The third threshold is higher than the second threshold.

Accordingly, if the evaluation value is below the second threshold, the second occupancy is under the status of underflow or a sudden decrease in the second buffer because of a scene of difficult coding is processed. In this case (i), the upper limit is corrected upwardly so that the upper limit becomes high in proportion to a difference between the second threshold and the evaluation value. Moreover, if the evaluation value is below the third threshold, the second occupancy is under the status of overflow or a sudden increase in the second buffer because of a scene of easy coding. In this case (ii), the lower limit is corrected downward so that the lower limit becomes low in proportion to a difference between the third threshold and the evaluation value.

The features of Applicants' independent Claim 21 permits to avoid an over-correction of a range of the quantization scale, because of a slight overflow and a slight underflow. Especially, from case (i), even if a scene of easy coding occurs during underflow of the second buffer, the image quality becomes stable because the quantization scale is not maintained at a high level above necessity. Furthermore, from case (ii), even if a scene of strict coding occurs during overflow of the second buffer, the image quality becomes stable because the quantization scale is not maintained at a low level that would be unnecessary.

Applicants respectfully submit that the above discussion is provided for explanatory purposes only, and is not intended to limit the scope of the claims. Any conflict between the above discussion and the claim language should be resolved in favor of the claims.

Turning now to the applied reference, Katta is directed to an MPEG2 encoding apparatus where a controlling unit 22 can adjust a target number of bits depending on the result of an error between a target number of bits, corresponding to the target bit rate, and the number of generated bits required for encoding an immediately preceding image segment group. (Katta, Abstract, Fig. 13.) With respect to Katta's Fig. 15, an exemplary method how to calculate a compression ratio for encoding is given, represented by a value "q_scale," that represents a quantizing parameter of the encoding processor 3. (Katta, col. 6, ll. 12-22, Fig. 3.) In this exemplary method, in a first step S20, many parameters are preset, for example the error between the target number of generated bits per group of frames (GOP), and a virtual buffer occupancy VBV. (Katta, col. 12, ll. 12-27, Fig. 15.) Subsequently, the value q_scale for the encoding is calculated in step S21. (Katta, col. 12, ll. 28-45.) This q_scale value is submitted to the encoding processor 20 for encoding images in step S22. (Katta, col. 12, ll. 46-47, Fig. 13, 15.)

With respect to Katta's Figure 13, the quantizer control block 22 detects the number of bits generated in each picture whenever a picture end timing signal is received from the encoding processor 20, and calculates the quantizing width q_scale from the target bit rate R and reaction coefficient T. (Katta, col. 11, ll. 47-63.) At the initial processing of Katta, a lower limit D0 of generated bits per picture is determined from the empirical rule that the picture quality drops significantly when the encoding rate drops below 1 Mbps, and an upper limit D1 of generated bits per picture is determined to match with the data transmission rate that the decoder is capable of supporting. (Katta, col. 12, ll. 12-27). Katta further explains that when the picture end timing signal is received, the number of bits "PIC_CNC" generated

in the current picture is detected, (Katta, col. 12, ll. 48-52) and a virtual buffer occupation capacity of the decoder is calculated as follows:

VBV_Buffer_fullness = VBV_Buffer_fullness - PIC_CNC+R/(picture rate).

(Katta, col. 12, Equation 20). Katta then determines (A) if VBV_Buffer_fullness is below a lower limit D2, a picture skip processing signal is supplied to the encoding processor 20 to avoid underflow. (Katta, col. 12, ll. 60-64). Moreover, Katta evaluates (B)if PIC_CNT is below the lower limit D0, the quantizing width q_scale is decreased so that the number of bits is not smaller than the lower limit D0 in the subsequent picture. (Katta, col. 12, l. 65, to col. 13, l. 2.) Katta also determines (C) if PIC_CNC is above the upper limit D1, the quantizing width q_scale is increased so that the number of bits is not larger than the upper limit D1 in the subsequent picture. (Katta, col. 13, ll. 44-48.)

Accordingly, from the above discussion of the reference Katta, when (A) occurs, the virtual buffer occupation capacity of the decoder is used for deciding whether an input buffer of the decoder is likely to underflow. Moreover, if the conditions (B)and (C) occur, the quantizing width q scale is corrected for each picture so that the number of bits generated from the subsequent picture is within a range between the lower limit D0 and the upper limit Dl. In other words, the lower limit D0 and the upper limit D1 are used as thresholds for the number of bits generated from each picture, and these thresholds ***are not*** corrected after setting initial values. Accordingly, Katta fails to teach the features related to the means for correcting the upper limit and lower limit, as required by Applicants' independent Claim 21.

The reference Kawashima, used by the pending Office Action to reject a dependent claim under 35 U.S.C. § 103(a), fails to remedy the deficiencies of Katta, even if we assume that the combination is proper. Kawashima is directed to a moving picture encoder that uses a unit to estimate the generated code amount, and also estimates an occupation of a virtual

buffer. (Kawashima, Abstract.) However, Kawashima fails to teach the means for correcting the upper limit and lower limit, as required by Applicants' Claim 21.

Independent Claim 26 recites features that are analogous to the features recited in independent Claim 21, but directed to a method. Accordingly, for the reasons stated above for the patentability of Claim 21, Applicants respectfully submit that the features of independent Claim 26, and the features of all associated dependent claims, are also believed to be patentably distinct over the applied references in view of the arguments regarding independent Claim 21.

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 21-30 is earnestly solicited.

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicants' undersigned representative at the below listed telephone number.

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